



Closeout Presentation on the DOE/SC CD-2/3b Review of the

Muon to Electron Conversion Experiment (Mu2e) Project

Fermi National Accelerator Laboratory

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Kurt Fisher

Committee Chair

Office of Science, U.S. Department of Energy

<http://www.science.doe.gov/opa/>



Review Committee Participants

Kurt Fisher, DOE/SC, Chairperson

Review Committee

Subcommittee 1—Technical

*Steve Gourlay, LBNL
Ken Marken, DOE/SC
Bruce Strauss, DOE/SC

Subcommittee 2—Cost and Schedule

*Jerry Gao, DOE/ASO
Ron Lutha, DOE/ASO

Subcommittee 3—Management

*Dan Green, Fermilab
Steve Meador, DOE/SC

*Lead

Observers

Mike Procario, DOE/SC
Ted Lavine, DOE/SC
Pepin Carolan, DOE/FSO



1. Have the Project and the Laboratory responded satisfactorily to the recommendations of the previous DOE review?
2. Is the detailed design sufficiently mature and appropriately reviewed so that the project can continue, as planned, with the procurement and fabrication work that will be approved by CD-3b?
3. Are there any outstanding issues that need to be addressed?



1. Have the Project and the Laboratory responded satisfactorily to the recommendations of the previous DOE review? **YES**

- Deliver a test and acceptance plan for the prototype TS module by November 7, 2014
– COMPLETED
- Deliver the following by April 15, 2015 prior to final approval of TS module procurement. In order:
 1. Successful test of TS prototype - **IN PROCESS**
 2. Complete TS coil module design – **REVIEW COMPLETED** (Will be validated by **prototype test**)
 3. Complete TS coil module drawings - **COMPLETE**
 4. Final TS coil module procurement readiness review following test of TS prototype
- Include a key personnel requirement in procurement contracts - **DONE**
- Aggressively pursue procurement and testing options that will reduce TS schedule risk – **IN PROCESS**



2. Is the detailed design sufficiently mature and appropriately reviewed so that the project can continue, as planned, with the procurement and fabrication work that will be approved by CD-3b?

YES, pending completion of remaining recommendations from the last review

3. Are there any outstanding issues that need to be addressed? NO



■ 2.2.1 Findings

- **Independent TS Design Review held on December 5, 2014**
 - Comments and recommendations are being incorporated into their plans
 - Six recommendations, 3 have been completed and remaining will be completed within the next few weeks (prior to construction readiness review)
- **TS Prototype has been completed and delivered (December 23, 2014)**
- **Test Facility is ready for test**
 - Prototype test plan is complete
 - Prototype Module acceptance plan is complete
- **Procurement plan and documents were presented to AOC on January 26, 2015**



■ 2.2.2 Comments

- Excellent progress towards TS Module validation
- The aggressive procurement schedule is contingent on timely completion of the TS Prototype test

■ 2.2.3 Recommendations

- Proceed to CD-2/3b
- Upon completion of previously noted “in process” recommendations, seek approval for TS procurement



1. Have the Project and the Laboratory responded satisfactorily to the recommendations of the previous DOE review? **Yes.**
2. Is the detailed design sufficiently mature and appropriately reviewed so that the project can continue, as planned, with the procurement and fabrication work that will be approved by CD-3b? **Yes**
3. Are there any outstanding issues that need to addressed? **Yes.**
See recommendations.



FINDINGS

- Total Project Cost (TPC) has been increased \$2.67M to \$273.67 million and contingency has increased to \$56.2M.
- CD-4 date has been pushed back one month to December 2022 and 24 months of schedule contingency still remains.
- The reported monthly project EAC is calculated via manual input from CAMs vs. an automatic CPI calculation.
- Due to a delay in the award of the Production and Detector Solenoids, the critical path currently runs through all the solenoids, PS, DS, and TS.
- An external Fermilab Annual EVMS Surveillance review was performed in December 2014. The Mu2e project was chosen to be looked at and no Corrective Action Requests (CARs) were found for the project. This is a significant accomplishment.



COMMENTS

- The project EVMS, variance reporting, and the change control system have been fully implemented and functioning well for the past two months. It appears the project team and management are embracing EVMS and using it as a tool to help manage the project. They should be commended for this effort.
- The project is now having monthly CAM/project control status meetings and is updating the ETC monthly. This is considered best practice.
- All prior DOE Cost and Schedule Committee recommendations have been satisfactorily addressed.
- The management EAC is \$2.6M higher than BAC. This increase in EAC is mainly due to addressing recommendations from the prior DOE review, the delayed CD-2/3b approval, and the TS test cryostat cost increase. At baseline, the BAC should match EAC to accurately reflect what the CAMs and management should be measured against.



RECOMMENDATIONS

- Before CD-2 approval, process a change request to have the BAC match the current EAC, and update all documentation (ie. PEP) with the new numbers.
- Proceed to CD-2/3b.



3. Cost and Schedule

J. Kao, R. Lutha

PROJECT STATUS as of December 2014		
Project Type	Line Item	
CD-1	Planned: 4 th Qtr FY2012	Actual: July 2, 2012
CD-2	Planned: Mar. 2015	Actual:
CD-3a	Planned: 4 th Qtr FY2012	Actual: July 10, 2014
CD-3b	Planned: Mar. 2015	Actual:
CD-3c	Planned: Jun. 2016	Actual:
CD-4	Planned: Dec. 2022	Actual:
TPC Percent Complete	Planned: ~25%	Actual: __~25%
TPC Cost to Date	\$56.5 M	
TPC Committed to Date	\$65.1 M	
TPC	\$273.7 M	
TEC	\$250.0 M	
Contingency Cost (w/Mgmt Reserve)	\$56.2 M	<u>35</u> % to go
Contingency Schedule on CD-4	<u>24</u> months	<u>33</u> % to go
CPI Cumulative	n/a	
SPI Cumulative	n/a	



1. **Have the Project and the Laboratory responded satisfactorily to the recommendations of the previous DOE review?**

Yes

1. **Is the detailed design sufficiently mature and appropriately reviewed so that the project can continue, as planned, with the procurement and fabrication work that will be approved by CD-3b? Yes**

3. **Are there any outstanding issues that need to be addressed?**

No



ES&H

- There were 7 recommendations. Six were asserted to have been completed and evidence for that was presented. The remaining recommendation concerned remote target handling and robot operations. The Project should consider consultation with and perhaps recruitment of experts outside FNAL.



FINDINGS

- Responses to all PM recommendations were posted and progress was presented**
- Those required for CD2/3b were completed**
- PMG, POG are in place – monthly meetings**
- EVMS – successfully reviewed by FNAL Surveillance Team.**
- Design Reviews – templates being created by FNAL**



- A strong response was made by the Project Management in regards to the findings of the last Mu2e review.
- The engagement of Chief Project Officer is a very positive additional effort for Mu2e and other Fermilab projects.
- The PM total cost is about 18% of the total cost. The cost exposure due to the PM marching army should be well covered within the contingency allocation.
- Given the highly matrixed and multi-divisional aspects of the Project, the ICD and ICD milestones, now “in progress” should be vigorously pursued and treated as controlled documents.
- Of the 4 recommendations to be assessed by CD-2/3b all were stated to be completed and reasonable evidence was presented.
- Of the 4 recommendations to be assessed later, 3 were completed and 1 was said to be in progress. That recommendation called for the Project to convene external, expert advisory groups. This recommendation should be vigorously pursued.



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- **Proceed to CD2/3b after responding to the recommendations of the other subcommittees.**